1   **Patent Application**

2

PROGRAMMABLE AUDIO ALERT SYSTEM AND METHOD

3

4

5

6   **COPYRIGHT NOTIFICATION**

7

13

14

15   **FIELD OF THE INVENTION**

16

17   The present invention relates to user-programmable audio alerts, such as telephone ring

18 tones. Embodiments of the present invention provide a system and method for users of devices,

19 including wireless telephones, to create and program an audio alert.

20

21

22   **BACKGROUND OF THE INVENTION**

23

24   With the proliferation of electronic devices, such as wireless telephones, pocket pagers,

25 and other devices that employ audio-based alerts, there is an increasing number of alerts heard in

26 a particular area at a given time. Many conventional wireless telephones have only one ring

27 tone available. Other conventional wireless telephones offer only a limited selection of pre-

28 programmed rings, or audio alerts, by which users can vary the audio alert, for example by

29 selecting from available ring tones. A disadvantage of having only a few different audio alerts

30 available in a device is that many such devices in a group of people emit the same ring tone,

1 causing all who are accustomed to that tone to check their device(s) to see if their device is

2 creating the sound.

3   Another disadvantage is that conventional audio alert systems do not allow combination

4 of audio alerts or combination of an audio alert(s) with other notification features to create

5 distinctive "morphed" audio alerts. Another disadvantage of conventional audio-based alert

6 systems is that they do not allow creation of original tone sequences, or unique audio alerts, by

7 users of wireless telephones or other devices. Another disadvantage of such currently available

8 devices is that they do not allow users to associate a unique audio alert with a particular

9 incoming signal. As such, current audio alert systems do not allow users to program customized

10 audio alerts.

11   Thus, there is a need to provide a greater choice of audio alerts by users of devices such

12 as wireless telephones. There is also a need to provide for audio alerts that are created by users

13 of such devices. There is also a need to provide a capability for users to program devices to

14 associate a unique audio alert with a particular incoming signal by which the signal source can be

15 identified.

16
17 **SUMMARY OF THE INVENTION**
18
19   Embodiments of the present invention provide user-programmable audio alert systems

20 and methods. One embodiment of the present invention comprises an audio alert created by a

21 user; a device capable of storing and emitting the audio alert; and a user-programmed data

22 structure that relates the audio alert with an audio alert triggering event and that is stored in the

23 device. When the device detects an occurrence of the audio alert triggering event, the device

24 emits the audio alert related to the event. A user may create a plurality of audio alerts, and the

2

1   user programs a data structure to relate one of the plurality of audio alerts with the audio alert

2   triggering event.

3   Audio alerts can be programmed using different devices and in various formats. In one

4   embodiment, audio alerts are programmed with a keypad. The device can comprise a wireless

5   telephone, and audio alerts can be programmed with a keypad on the wireless telephone. In an

6   embodiment of the present invention, an audio alert comprises a sequence of numbers in which

7   each number represents a distinct musical tone. In other embodiments, audio alerts are

8   programmed with a personal computer.

9   A device of the present invention can include a capability to transmit audio alerts to

10   another device capable of storing and emitting the audio alerts. In addition, such a device further

11   includes a capability to transmit a user-programmed data structure to another device so that when

12   the other device detects an occurrence of the audio alert triggering event, the other device emits

13   the audio alert related to the triggering event. The present invention also includes devices

14   capable of receiving from another device audio alerts, user-programmed data structures related to

15   particular audio alert triggering events, and audio alert triggering events, or signals.

16   In embodiments of this system, an audio alert triggering event has a capability of

17   modulating an audio alert according to an external variable. Such an external variable can

18   comprise global positioning information, including relative distance information and/or

19   directional information. In other embodiments, the external variable comprises retail

20   information, such as price information.

21   Embodiments of the present invention also include a method of users programming audio

22   alerts comprising the steps of creating an audio alert; providing a device capable of storing and

23   emitting the audio alert; storing the audio alert in the device; and programming in the device a

1   data structure relating the audio alert with an audio alert triggering event. When the device

2   detects an occurrence of the audio alert triggering event, the device emits the audio alert related

3   to the triggering event. Embodiments of methods also include creating a plurality of audio alerts;

4   selecting one of the plurality of audio alerts; and programming the data structure to relate the

5   selected audio alert with the audio alert triggering event.

6   Embodiments of the present invention also include a user-programmable device for

7   emitting an audio alert comprising a storage capacity; an audio alert created by a user and stored

8   in the device; a user-programmed data structure that relates the audio alert with an audio alert

9   triggering event and is stored in the device; and a capability of emitting the audio alert. When

10   the device detects an occurrence of the audio alert triggering signal, the device emits the audio

11   alert related to the event.

12   Features of a user-programmable audio alert system, method, and device of the present

13   invention may be accomplished singularly, or in combination, in one or more of the

14   embodiments of the present invention. As will be appreciated by those of ordinary skill in the

15   art, the present invention has wide utility in a number of applications as illustrated by the variety

16   of features and advantages discussed herein.

17   A user-programmable audio alert system, method, and device of the present invention

18   provides numerous advantages over prior audio alert systems. For example, the present

19   invention advantageously provides a system that allows creation of unique audio alerts by users,

20   rather than limiting a user to one, or a few, pre-programmed audio alert(s) in a device.

21   Another advantage is that the present invention provides for programming a user-selected

22   audio alert to emit when a device detects an occurrence of a particular audio alert triggering

4

1   event. As such, users can customize audio alerts that are easily recognizable and that are

2   associated with a triggering event from a particular device.

3   Another advantage is that the present invention provides a simple and easy means for

4   creating audio alerts by use of a standard numeric keypad, such as a standard telephone keypad.

5   In addition, the present invention allows users to create audio alerts with a sequence of numbers

6   from a keypad in which each number represents a distinct musical tone.

7   The present invention also provides the advantage of readily available means for

8   programming and storing audio alerts using a wireless telephone.

9   The present invention also allows programming of audio alerts in various formats,

10 including standard Musical Instrument Digital Interface (MIDI) format. Such format flexibility

11 provides the advantage of having a wide range of content available for creating unique audio

12 alerts.

13   Another advantage is that the present invention allows transmission of audio alerts for

14 use with other devices. Format interchangeability allows use of audio alerts created in one

15 format to be transmitted and used in a different format with another device.

16   Still another advantage is that the present invention provides a capability of modulating

17 audio alerts according to an external variable, including position, distance, and/or direction

18 relative to another device or location. The present invention also provides for beneficial

19 modulation of external variables such as retail and/or information.

20   Still another advantage is that the present invention can be used in a variety of

21 applications, including with wireless telephones, electronic mail, other messaging systems, bar

22 code scanners, and other systems using audio alerts.

1   Yet another advantage is that the present invention provides interest to consumers in

2   personalizing communications systems and electronic equipment.

3   As will be realized by those of skill in the art, many different embodiments of a user-

4   programmable audio alert system, method, and device according to the present invention are

5   possible. Additional uses, objects, advantages, and novel features of the invention are set forth

6   in the detailed description that follows and will become more apparent to those skilled in the art

7   upon examination of the following or by practice of the invention.

8

BRIEF DESCRIPTION OF THE DRAWINGS

9

10

11   FIGURE 1 is an illustration of an audio alert system in an embodiment of the present

12   invention.

13   FIGURE 2 is an illustration of an audio alert system in another embodiment of the

14   present invention.

15   FIGURE 3 is an illustration of an audio alert system in still another embodiment of the

16   present invention.

17   FIGURE 4 is an illustration of an audio alert system in still another embodiment of the

18   present invention.

19   FIGURE 5 is flow chart showing the steps in an embodiment of a method of the present

20   invention.

21

22   **DETAILED DESCRIPTION**

23

24   Figures 1-5 show various aspects of embodiments of the present invention. One

25   embodiment comprises a user-programmable audio alert system that allows a user to create audio

26   alerts from a standard numeric keypad, such as on a wireless telephone, and to program the

1   telephone to emit a selected audio alert when the telephone receives a particular signal. Fig. 1

2   shows one such embodiment.

3   Referring to Fig. 1, audio alert system 10 includes a wireless telephone 20 having a

4   standard numeric keypad 21 and a storage capacity 22 for storing data, for example in a non-

5   volatile memory. Wireless telephone 20 includes a receiver 23 capable of receiving incoming

6   signals. Signaling is utilized in a telecommunications system to perform call-handling functions.

7   For example, signaling includes the process of generating and exchanging information among

8   components of a telecommunications system to establish, monitor, or release connections.

9   Alerting, or ringing, signals notify users or equipment of some occurrence, such as an incoming

10   call. An alerting signal is initiated by pressing appropriate dialing keypads on a call-originating

11   telephone to generate a dual-tone multiple frequency (DTMF) address signal. A DTMF address

12   signal utilizes combinations of frequencies that represent digits or characters to create the unique

13   telephone number address to which the ringing signal of an incoming telephone call is

14   transmitted. In Fig. 1, the receiver 23 is capable of receiving alerting, or ringing, signals that

15   notify the wireless telephone 20 of an incoming call from the particular call-originating

16   telephone number.

17   Wireless telephone 20 also includes an emitter 24 for emitting ringing signals, or audio

18   alerts. An audio alert comprises the sound emitted from a device when the device detects an

19   occurrence of a particular triggering event. A user of the wireless telephone 20 creates unique

20   audio alerts 33, 43, and 53 by programming with the keypad 21, and stores alerts 33, 43, and 53

21   in storage 22 of the wireless telephone 20. The wireless telephone 20 can be programmed to

22   emit one of the unique audio alerts 33, 43, and 53 when the wireless telephone 20 detects an

23   occurrence of a triggering event.

1   In another aspect of the present invention, audio alerts are programmed for storage,

2   retrieval, and use in various functional data components, such as in a data structure, array, list,

3   and file. A functional data component provides an interface between an audio alert triggering

4   event, an audio alert, and a device. A user programs a data structure, for example, to relate the

5   detection of an occurrence of a pre-determined audio alert triggering event to a particular audio

6   alert, and to cause a device in which the data structure is stored to emit the audio alert when the

7   triggering event is detected. An example of an audio alert triggering event is a ringing signal

8   originating from a particular telephone number. Another example of an audio alert triggering

9   event is an electronic mail message received from a particular computer network address. In

10   embodiments of the present invention, a user can program a data structure to relate an occurrence

11   of a particular audio alert triggering event to an audio alert pre-programmed in a device by the

12   manufacturer or to an original audio alert created by the user.

13   In an embodiment as shown in Fig. 1, data structure 30 is programmed to relate the

14   detection 31 of an occurrence of audio alert triggering event 32 to audio alert 33. When wireless

15   telephone 20 detects an occurrence of audio alert triggering event 32, data structure 30 causes

16   emitter 24 to emit an iteration 33A of audio alert 33. In like fashion, data structure 40 relates the

17   detection 41 of an occurrence of audio alert triggering event 42 to audio alert 43. When wireless

18   telephone 20 detects an occurrence of audio alert triggering event 42, data structure 40 causes

19   emitter 24 to emit an iteration 43A of audio alert 43. Similarly, data structure 50 relates the

20   detection 51 of an occurrence of audio alert triggering event 52 to audio alert 53, such that when

21   wireless telephone 20 detects an occurrence of audio alert triggering event 52, data structure 50

22   causes emitter 24 to emit an iteration 53A of audio alert 53. While Fig. 1 shows three instances

23   of a data structure relating detection of an audio alert triggering event to an audio alert in a

1 device, embodiments of the present invention include more than three audio alerts programmed

2 in a device, and more than three data structures relating detection of particular audio alert

3 triggering events to audio alerts.

4 As an example of the operation of the audio alert system in Fig. 1, a user of wireless

5 telephone 20 programs data structure 40 to relate detection 41 of audio alert triggering event 42,

6 which, by way of example, is the ringing signal from the user's home telephone number, to audio

7 alert 43. When a call is made to wireless telephone 20 from the user's home telephone, wireless

8 telephone 20 detects audio alert triggering event 42. Data structure 40 then causes wireless

9 telephone 20 to emit an iteration 43A of audio alert 43. Because audio alert 43 is uniquely

10 related to calls from the user's home telephone number, the user is able to auditorily identify that

11 the call received on wireless telephone 20 originated from her home telephone.

12 While the embodiment in Fig. 1 shows that a user can create, or program, audio alerts

13 using a keypad on a wireless telephone, audio alerts can also be programmed using keypads on

14 other data entry devices, for example a bar code scanner used with a check-out register. In other

15 embodiments, audio alerts are created with one device and transmitted to another device for

16 storage and use. For example, audio alerts can be programmed on one telephone and transmitted

17 to another telephone for storage and use. Audio alerts can also be created using a personal

18 computer and then uploaded to another device, such as a wireless telephone. In alternative

19 embodiments, audio alerts are stored on a computer network server and may be accessed and

20 used with multiple devices.

21 Audio alerts of the present invention can be programmed, stored, and transmitted in

22 various formats. For example, audio alerts can be created using a Musical Instrument Digital

23 Interface (MIDI) format. MIDI is an interface that enables a personal computer to send and

9

1   receive messages for the purpose of creating music, sound, or lighting. In another format, an

2   audio alert comprises a sequence of numbers programmed using a keypad, wherein the numbers

3   represent musical notes. In other embodiments, audio alerts are created, stored, and transmitted

4   in MP3 format. MP3 is a Moving Picture Expert Group (MPEG) standard comprising a digital

5   audio compression algorithm used especially for digitally transmitting music over a computer

6   network, such as the Internet. In still other embodiments, audio alerts are programmed using a

7   unique audio alert protocol format.

8   In embodiments of the present invention, audio alerts can be created, saved, and

9   transmitted in one format and converted to a different format for use. For example, an audio

10   alert programmed to play a Bach piece in a unique audio alert protocol could be transmitted to

11   another device and converted into a MIDI format and played with different instruments. Audio

12   alerts can be created and transmitted using a pulse-based format or a tone-based format, such as

13   dual tone multiple frequency (DTMF). DTMF is a dialing method which utilizes tones to

14   represent numbers for the dialing procedure. Such format interchangeability of audio alerts

15   allows use of the audio alerts in any device with the proper interface, and thus flexibility in a

16   variety of applications.

17   In embodiments of the present invention, audio alerts comprise content in various formats

18   that may be pre-existing, including professionally created content, and/or created by a user. As

19   an example, a user may program an audio alert using the first bar of Beethoven's Ninth

20   Symphony. Alternatively, an audio alert may comprise a digital recording of a user's spouse

21   saying "It's me!" Audio alerts can be customized to include a combination of pre-existing and

22   user-created content. For example, a user could customize an audio alert by combining the first

23   bar of Beethoven's Ninth Symphony and a digital recording of a user's spouse saying "It's me!"

10

1   Embodiments of the present invention include audio alert triggering events that are

2   detected by a device, such as the wireless telephone 20 in Fig. 1. Audio alert triggering events

3   comprise various forms and may be transmitted in different modes, depending on the design and

4   detection capabilities of a receiving device. One example of an audio alert triggering event is a

5   ringing signal originating from a particular telephone number. A ringing signal using a DTMF

6   format is a typical call notification modality utilized in a telecommunications system. Another

7   example of an audio alert triggering event is an electronic mail message received from a

8   particular computer network address. In this instance, an audio alert triggering signal can be

9   transmitted digitally along with the electronic mail message. In embodiments, audio alert

10   triggering events, or signals, are transmitted between devices as data embedded within a primary

11   message, as tags in a transmission language, and utilizing other suitable means, such as, for

12   example, radio frequency and infrared transmissions.

13   Audio alerts of the present invention can be combined with other audio alerts and/or with

14   other notification features. For example, an original audio alert tone sequence could be

15   combined with a commonly available audio alert tune to create a distinctive "morphed" audio

16   alert. Also, a short voice recording could be added to a distinctive audio alert.

17   In embodiments of the present invention, user-programmed audio alerts and data

18   structures are exchanged between devices. Referring to Fig. 2, wireless telephone 20 of Fig. 1

19   has a capability to transmit user-programmed audio alerts 33, 43, and 53 and data structures 30,

20   40, and 50 to another wireless telephone 120 capable of receiving, storing, and using such

21   transmissions. For purposes of illustration, wireless telephone 120 is similar to wireless

22   telephone 20, and includes a keypad 121, a storage capacity 122 for storing data, a receiver 123

23   capable of receiving audio alert triggering events, such as ringing signals, and an emitter 124 for

11

1 emitting audio alerts. In wireless telephone 20, data structure 40 is programmed to relate the

2 detection 41 of an occurrence of audio alert triggering event 42 to audio alert 43. A user

3 transmits audio alert 43 and data structure 40 from wireless telephone 20 to wireless telephone

4 120. Wireless telephone 120 receives the transmission and stores audio alert 43 and data

5 structure 40 in storage 122. Thereafter, when wireless telephone 120 detects an occurrence of

6 audio alert triggering event 42, data structure 40 causes emitter 124 to emit an iteration 43A of

7 audio alert 43.

8   Audio alerts can be transmitted to dissimilar wireless telephones and to other types of

9 devices, provided that a receiving device is capable of receiving and storing transmissions of

10 audio alerts. A receiving device may have the same audio alert architecture, for example,

11 software or format, as a transmitting device. However, a receiving device can use a different

12 format, or software, to store and emit audio alerts after receiving audio alert transmissions from

13 another device. In addition, audio alerts can be transmitted between devices in various ways,

14 such as by radio frequency, infrared signal, direct connection, or by other suitable means.

15   In embodiments of the present invention, audio alerts are associated with particular

16 functions, such as auditorily identifying the originating number of an incoming telephone ringing

17 signal. Another function is auditory identification of a specific sending address of an electronic

18 mail message over a computer network. In addition to such identification functions, audio alerts

19 can be modulated according to an external variable. Modulation is a process of varying certain

20 parameters in a carrier, or base, signal in accordance with the characteristics of another signal,

21 such as an information-bearing, modulating input signal. A base signal can be modulated by

22 changes in amplitude, frequency, phase, or in other characteristics. Audio alerts can be

12

1 modulated by variables so as to effect changes in duration, intensity, pitch, and/or octaves of the

2 emitted audio alerts.

3   Fig. 3 illustrates an embodiment of such modulation of emitted audio alerts by external

4 variables. In Fig. 3, wireless telephone 220 includes a transmitter 226 for transmitting signals,

5 including audio alert triggering event, or signal, 52. Wireless telephone 220 also includes a

6 global positioning system interface 225, which allows receipt and transmission of global

7 positioning information, such as latitude, longitude, and altitude. Wireless telephone 20 includes

8 a receiver 23 for receiving incoming transmissions, an emitter 24 for emitting audio alerts, and

9 storage 22 having audio alert 53 and data structure 50 stored therein. Data structure 50 is

10 programmed to relate detection 51 of an occurrence of audio alert triggering event 52 to audio

11 alert 53, such that when wireless telephone 20 detects an occurrence of audio alert triggering

12 event 52, data structure 50 causes emitter 24 to emit an iteration 53A of audio alert 53. Wireless

13 telephone 20 also includes a global positioning system (GPS) interface 25. When wireless

14 telephone 220 is a distance d1 from wireless telephone 20, wireless telephone 220 transmits

15 audio alert triggering signal 52 to wireless telephone 20 via global positioning system 60. Upon

16 receiving audio alert triggering signal 52 from wireless telephone 220 at distance d1, wireless

17 telephone 20 detects audio alert triggering signal 52, and data structure 50 causes emitter 24 to

18 emit iteration 53A of audio alert 53 to indicate the relative distance d1 between the positions of

19 the two wireless telephones 20 and 220.

20   As wireless telephone 220 moves from distance d1 to distance d2 relative to wireless

21 telephone 20, wireless telephone 220 transmits audio alert triggering signal 52 to wireless

22 telephone 20 via global positioning system 60. Upon receiving audio alert triggering signal 52 at

23 distance d2, wireless telephone 20 detects audio alert triggering signal 52, and data structure 50

13

1 causes emitter 24 to emit iteration 53B of audio alert 53 to indicate the new relative distance d2

2 between the positions of the two wireless telephones 20 and 220. Iteration 53B of audio alert 53

3 emitted from wireless telephone 20 is a modulated variation of iteration 53A of audio alert 53,

4 indicating a change in relative distance between the two wireless telephones 20 and 220. Thus,

5 audio alert 53 is modulated by the external variable of distance between the two wireless

6 telephones 20 and 220. Transmission of audio alert triggering signal 52 from wireless telephone

7 220 can be continuous as wireless telephone 220 moves in position from distance d1 to distance

8 d2 relative to wireless telephone 20. During such movement, modulation of iterations of audio

9 alert 53 emitted by wireless telephone 20 changes, becoming louder or more rapid, for example,

10 indicating continuing changes in relative distance between the two wireless telephones 20 and

11 220.

12 　　　　Another variable by which audio alerts can be modulated using global positioning

13 information is directional movement. As shown in Fig. 3, when wireless telephone 220 is

14 positioned at a direction, or angle, a1 from wireless telephone 20, wireless telephone 220

15 transmits audio alert triggering signal 52 to wireless telephone 20 via global positioning system

16 60. Upon receiving audio alert triggering signal 52 from wireless telephone 220 at direction a1,

17 wireless telephone 20 detects audio alert triggering signal 52, and data structure 50 causes

18 emitter 24 to emit iteration 53C of audio alert 53 to indicate the relative direction a1 between the

19 positions of the two wireless telephones 20 and 220.

20 　　　　As wireless telephone 220 moves from direction a1 to direction a2 relative to wireless

21 telephone 20, wireless telephone 220 transmits audio alert triggering signal 52 to wireless

22 telephone 20 via global positioning system 60. Upon receiving audio alert triggering signal 52

23 from wireless telephone 220 at direction a2, wireless telephone 20 detects audio alert triggering

1   signal 52, and data structure 50 causes emitter 24 to emit iteration 53D of audio alert 53 to

2   indicate the new relative direction a2 between the positions of the two wireless telephones 20

3   and 220. Iteration 53D of audio alert 53 emitted from wireless telephone 20 is a modulated

4   variation of iteration 53C of audio alert 53, indicating a change in relative direction between the

5   two wireless telephones 20 and 220 from direction a1 to direction a2. Thus, audio alert 53 is

6   modulated by the external variable of direction between the two wireless telephones 20 and 220.

7   As with changing relative distance, transmission of audio alert triggering signal 52 from wireless

8   telephone 220 can be continuous as wireless telephone 220 changes from direction a1 to

9   direction a2 relative to wireless telephone 20. During such movement, modulation of audio alert

10   52 emitted by wireless telephone 20 changes, becoming louder or more rapid, for example,

11   indicating continuing changes in relative direction between the two wireless telephones 20 and

12   220.

13   Modulation of audio alerts according to external variables has practical applications, such

14   as being able to rapidly determine the proximity of another device or a person with a device. As

15   in the embodiment in Fig. 3, for example, modulating audio alerts in a first device, based on the

16   calculated distance of the first device from a second device using GPS data, allows real-time

17   notification of movement between the two devices. As the second device moves relative to the

18   first device, the audio alert changes correspondingly. Such an embodiment is useful for finding

19   someone in close proximity, but not easily seen, as in a crowd. In addition, such a system can be

20   used to identify the relative distance from more than one person. For example, if a distinctive

21   audio alert is programmed into a device for devices transported by each of several people, for

22   example children in a family, the distinctive audio alert for each device (and person) would

1   change as that person's position changes relative to the monitoring device. As such, a parent

2   could monitor each child's relative distance, and movement, from the parent.

3   Fig. 4 illustrates another embodiment of audio alert modulation by external variables. In

4   Fig. 4, wireless telephone 20 includes a receiver 23 for receiving incoming transmissions, an

5   emitter 24 for emitting audio alerts, and storage 22 having audio alert 33 and data structure 30

6   stored therein. Data structure 30 is programmed to relate detection 31 of an occurrence of audio

7   alert triggering event, or signal, 32 to audio alert 33. When wireless telephone 20 detects an

8   occurrence of audio alert triggering event 32, data structure 30 causes emitter 24 to emit an

9   iteration 33A of audio alert 33. Wireless telephone 20 and receiver 23 are adapted to receive

10   transmissions carrying retail information. Such retail information may include, for example,

11   proximity to a particular type of retail store, availability of a particular retail item, price range,

12   and relative price data. A device may be activated to receive price information for a product

13   from a particular retail store, for example by pointing the device toward the store.

14   As an example of audio alert modulation by retail information, audio alert triggering

15   signal 32 comprises the price for a selected product. Data structure 30 is programmed to detect

16   audio alert triggering signal 32, and in particular the price of the selected product carried with the

17   audio alert triggering signal 32. When wireless telephone 20 is activated to receive price

18   information for the selected product from retail store A (70), audio alert triggering signal 32

19   carrying price information 71 is transmitted from retail store A (70) for that product to the

20   wireless telephone 20. Upon receiving audio alert triggering signal 32 and price information 71

21   from retail store A (70), wireless telephone 20 detects audio alert triggering signal 32, and data

22   structure 30 causes emitter 24 to emit iteration 33A of audio alert 33 to indicate price 71.

23   Wireless telephone 20 is then activated to receive price information for the same product

16

1   from retail store B (80). Audio alert triggering signal 32 carrying price information 81 is

2   transmitted from retail store B (80) for that product to the wireless telephone 20. Upon receiving

3   audio alert triggering signal 32 and price information 81 from retail store B (80), wireless

4   telephone 20 detects audio alert triggering signal 32, and data structure 30 causes emitter 24 to

5   emit iteration 33B of audio alert 33 to indicate price 81 relative to price information 71. Audio

6   alert 33B is a modulated variation, for example varied in pitch or frequency, of audio alert 33A,

7   indicating a relative price difference between product price information 81 for retail store B (80)

8   and product price information 71 for retail store A (70).

9   In embodiments, modulation of audio alerts according to price information can be

10   customized. For example, an audio alert can be programmed to modulate upon receipt of price

11   information from a retail store relative to a predetermined price to indicate, for example, prices

12   higher or lower than a given price range. Using such a system, a customer can quickly and easily

13   compare prices for a product in different retail stores. Alternatively, audio alerts can be

14   programmed to include brand and/or advertising information, for example, to indicate presence

15   of a particular brand of item.

16   In the embodiment shown in Fig. 4, audio alert triggering signal 92 comprises the price

17   for a selected product. Data structure 90 is programmed in wireless telephone 20 to detect

18   whether a price for the selected product carried on audio alert triggering signal 92 falls within a

19   pre-determined price range. When wireless telephone 20 is activated to receive price

20   information for the selected product from retail store A (70), audio alert triggering signal 92

21   carrying price information 71 is transmitted from retail store A (70) for that product to the

22   wireless telephone 20. Upon receiving audio alert triggering signal 92 and price information 71

23   from retail store A (70), wireless telephone 20 detects audio alert triggering signal 32. The price

1   71 of the selected product in retail store A (70) falls within the pre-determined price range

2   programmed in data structure 90, and data structure 90 causes emitter 24 to emit iteration 93A of

3   audio alert 93 to indicate that price 71 falls within the pre-determined range. If price 71 did not

4   fall within the price range programmed for detection in data structure 90, no audio alert would be

5   emitted.

6   Wireless telephone 20 could then be activated to receive price information for the

7   selected product from retail store A (80). If the price 81 fell within the pre-determined price

8   range programmed for detection in data structure 90, iteration 93A of audio alert 93 would be

9   emitted, and if price 81 did not fall within the programmed price range, no audio alert would be

10   emitted. Using such an embodiment of the present invention in this manner, whether a selected

11   product had a price within a programmed range could be determined for multiple retail stores.

12   In other embodiments, audio alerts are modulated by other programmed variables, such

13   as the time of day. For instance, in a device having an appointment calendar, an audio alert can

14   be programmed to emit at intervals and be modulated to be emitted more loudly as the time of an

15   appointment draws nearer. In addition, a user can select a particular audio alert to be related to

16   such a time-based signal unique to the type of appointment the audio alert is signifying. For

17   example, one user-programmed audio alert could be used to signify appointments inside an

18   office while another user-programmed audio alert could be used to signify appointments outside

19   the office.

20   As mentioned herein, audio alerts of the present invention can be programmed in various

21   formats. In one such format, an audio alert comprises a sequence of numbers programmed using

22   a standard numeric keypad, such as on a wireless telephone or other data entry terminal. In an

23   embodiment, numbers on the keypad correspond to relative tones in the musical scale. The

1 number 1 corresponds to middle C, and each higher number represents a half-tone increment,

2 such that 1=C, 2=C#, 3=D, 4=D#, and so on. A total of twelve numbers represent an entire

3 octave. As an example, the musical notes for the song "Happy Birthday" (in the key of C) would

4 be represented by 1 1 3 1 6 5 1 1 3 1 8 6 1 1 (111) 10 6 5 3 (11) (11) 10 6 8 6. Striking the

5 appropriate key twice in rapid succession represents the corresponding note in the next higher, or

6 second, octave. In like fashion, striking the appropriate key three times in rapid succession

7 represents the corresponding note in the next successively higher, or third, octave. In this

8 example, "(11)" indicates striking the "1" key two times rapidly in succession, similar to double-

9 clicking a computer mouse, and represents the C note in the second octave. Similarly, "(111)"

10 indicates striking the "1" key three times rapidly in succession, and represents the C note in the

11 third octave.

12 In addition, both note duration and intensity can be varied. For example, the asterisk key

13 (*) could represent duration of notes, so that entering the sequence 1 1 3 * * 1 would make the

14 third note twice as long, and in the above example, would make the resulting tune sound more

15 like the traditional "Happy Birthday" tune. In similar fashion, the pound key (#) can be used to

16 represent note intensity such that entering the # key after a note would make the previous note

17 louder. For example, entering the # key following the sequence 1 1 3 1 6 5 # would make the

18 note represented by "5" the loudest in this sequence. In such embodiments, a standard numeric

19 keypad can be utilized by users to simply and easily program audio alerts.

20 The present invention comprises embodiments of methods for users to program audio

21 alerts. Fig. 5 shows one such embodiment. As shown in the method 300 in Fig. 5, users can

22 create audio alerts with a wireless telephone keypad (310) or with a personal computer (320).

23 Method 300 includes providing a device capable of storing and emitting audio alerts (330). A

1   user stores audio alerts (340) in the device. The user selects one of the audio alerts (350) and

2   programs in the device a data structure relating the selected audio alert with an audio alert

3   triggering event (360). When the device detects the audio alert triggering event (370), the device

4   emits the audio alert related to the triggering event (380).

5   In embodiments of methods, a user transmits user-programmed audio alerts and data

6   structures from one device to another device capable of storing and using the audio alerts.

7   In other embodiments of methods, a device modulates audio alerts according to an

8   external variable. Audio alerts are modulated according to external variables such as global

9   positioning information, including distance and direction information, and retail information,

10   such as price information.

11   In still other embodiments of methods, users program audio alerts comprising a sequence

12   of numbers wherein each number represents a distinct musical tone.

13   Embodiments of systems and methods of the present invention include applications in a

14   variety of devices and communication systems. For example, audio alerts can be created, stored,

15   and used in conjunction with wireless telephones, paging devices, dedicated global positioning

16   system devices, and other wireless devices such as personal digital assistants (PDAs). In

17   addition, audio alerts of the present invention can be utilized with electronic mail message

18   systems in a computer network.

19   In other embodiments, audio alerts are programmed by users in bar code scanners, such

20   as those used with check-out registers in retail stores. For example, at a supermarket check-out

21   area, bar code scan tones are generally the same for each scanner, making it difficult to discern

22   which register is scanning an item. Using the system and method of the present invention,

23   unique audio alerts can be created and stored for each register and/or each check-out clerk. For

1   example, each clerk's personal audio alert could be created using a standard number keypad,

2   such as keypads supplied on the register/scanner. A personal identifier, such as the clerk's last

3   name or employee identification number could be entered to create the unique audio alert. When

4   the clerk logs in to a cash register/scanner, that particular clerk's unique user-programmed audio

5   alert would be emitted each time an item is scanned by that clerk. As a result of scanning by a

6   clerk producing a personalized audio alert, customers could correlate the scan of an item for

7   purchase with the particular scanner being used by the clerk. In an alternative embodiment, a

8   unique audio alert for each product, product type, and/or brand could be programmed to be

9   emitted when the particular product or product type is scanned.

10   Although the present invention has been described with reference to particular

11   embodiments, it should be recognized that these embodiments are merely illustrative of the

12   principles of the present invention. Those of ordinary skill in the art will appreciate that a user-

13   programmable audio alert system and method of the present invention may be configured and

14   implemented in other ways and embodiments. Accordingly, the description herein should not be

15   read as limiting the present invention, as other embodiments also fall within the scope of the

16   present invention.

17

18

19

20

21

22

23